1600

RAW SEQUENCE LISTING   DATE: 11/14/2001
PATENT APPLICATION: US/09/590,375   TIME: 13:38:59

Input Set : A:\2173-0120.st25.txt
Output Set: N:\CRF3\11142001\I590375.raw

ENTERED

```
 3 <110> APPLICANT: ENDO, Keiji et al.
 5 <120> TITLE OF INVENTION: MUTANT ALPHA-AMYLASES
 7 <130> FILE REFERENCE: 2173-0120P
 9 <140> CURRENT APPLICATION NUMBER: US 09/590,375
10 <141> CURRENT FILING DATE: 2000-06-09
12 <150> PRIOR APPLICATION NUMBER: JP P1999-163569
13 <151> PRIOR FILING DATE: 1999-06-10
15 <160> NUMBER OF SEQ ID NOS: 23
17 <210> SEQ ID NO: 1
18 <211> LENGTH: 480
19 <212> TYPE: PRT
20 <213> ORGANISM: Bacillus sp. KSM-K38
22 <400> SEQUENCE: 1
23 Asp Gly Leu Asn Gly Thr Met Met Gln Tyr Tyr Glu Trp His Leu Glu
24                   5                  10                  15
25 Asn Asp Gly Gln His Trp Asn Arg Leu His Asp Asp Ala Ala Ala Leu
26              20                  25                  30
27 Ser Asp Ala Gly Ile Thr Ala Ile Trp Ile Pro Pro Ala Tyr Lys Gly
28          35                  40                  45
29 Asn Ser Gln Ala Asp Val Gly Tyr Gly Ala Tyr Asp Leu Tyr Asp Leu
30      50                  55                  60
31 Gly Glu Phe Asn Gln Lys Gly Thr Val Arg Thr Lys Tyr Gly Thr Lys
32 65                  70                  75                  80
33 Ala Gln Leu Glu Arg Ala Ile Gly Ser Leu Lys Ser Asn Asp Ile Asn
34                  85                  90                  95
35 Val Tyr Gly Asp Val Val Met Asn His Lys Met Gly Ala Asp Phe Thr
36              100                 105                 110
37 Glu Ala Val Gln Ala Val Gln Val Asn Pro Thr Asn Arg Trp Gln Asp
38              115                 120                 125
39 Ile Ser Gly Ala Tyr Thr Ile Asp Ala Trp Thr Gly Phe Asp Phe Ser
40      130                 135                 140
41 Gly Arg Asn Asn Ala Tyr Ser Asp Phe Lys Trp Arg Trp Phe His Phe
42 145                 150                 155                 160
43 Asn Gly Val Asp Trp Asp Gln Arg Tyr Gln Glu Asn His Ile Phe Arg
44              165                 170                 175
45 Phe Ala Asn Thr Asn Trp Asn Trp Arg Val Asp Glu Glu Asn Gly Asn
46              180                 185                 190
47 Tyr Asp Tyr Leu Leu Gly Ser Asn Ile Asp Phe Ser His Pro Glu Val
48          195                 200                 205
49 Gln Asp Glu Leu Lys Asp Trp Gly Ser Trp Phe Thr Asp Glu Leu Asp
50      210                 215                 220
51 Leu Asp Gly Tyr Arg Leu Asp Ala Ile Lys His Ile Pro Phe Trp Tyr
52 225                 230                 235                 240
53 Thr Ser Asp Trp Val Arg His Gln Arg Asn Glu Ala Asp Gln Asp Leu
54              245                 250                 255
55 Phe Val Val Gly Glu Tyr Trp Lys Asp Asp Val Gly Ala Leu Glu Phe
56              260                 265                 270
```

RAW SEQUENCE LISTING   DATE: 11/14/2001
PATENT APPLICATION: US/09/590,375 TIME: 13:38:59

Input Set : A:\2173-0120.st25.txt
Output Set: N:\CRF3\11142001\I590375.raw

57 Tyr Leu Asp Glu Met Asn Trp Glu Met Ser Leu Phe Asp Val Pro Leu
58   275   280   285
59 Asn Tyr Asn Phe Tyr Arg Ala Ser Gln Gln Gly Gly Ser Tyr Asp Met
60   290   295   300
61 Arg Asn Ile Leu Arg Gly Ser Leu Val Glu Ala His Pro Met His Ala
62 305   310   315   320
63 Val Thr Phe Val Asp Asn His Asp Thr Gln Pro Gly Glu Ser Leu Glu
64   325   330   335
65 Ser Trp Val Ala Asp·Trp Phe Lys Pro Leu Ala Tyr Ala Thr Ile Leu
66   340   345   350
67 Thr Arg Glu Gly Gly Tyr Pro Asn Val Phe Tyr Gly Asp Tyr Tyr Gly
68   355   360   365
69 Ile Pro Asn Asp Asn Ile Ser Ala Lys Lys Asp Met Ile Asp Glu Leu
70   370   375   380
71 Leu Asp Ala Arg Gln Asn Tyr Ala Tyr Gly Thr Gln His Asp Tyr Phe
72 385   390   395   400
73 Asp His Trp Asp Val Val Gly Trp Thr Arg Glu Gly Ser Ser Ser Arg
74   405   410   415
75 Pro Asn Ser Gly Leu Ala Thr Ile Met Ser Asn Gly Pro Gly Gly Ser
76   420   425   430
77 Lys Trp Met Tyr Val Gly Arg Gln Asn Ala Gly Gln Thr Trp Thr Asp
78   435   440   445
79 Leu Thr Gly Asn Asn Gly Ala Ser Val Thr Ile Asn Gly Asp Gly Trp
80   450   455   460
81 Gly Glu Phe Phe Thr Asn Gly Gly Ser Val Ser Val Tyr Val Asn Gln
82 465   470   475   480
85 <210> SEQ ID NO: 2
86 <211> LENGTH: 485
87 <212> TYPE: PRT
88 <213> ORGANISM: Bacillus sp. KSM-AP1378
90 <400> SEQUENCE: 2
91 His His Asn Gly Thr Asn Gly Thr Met Met Gln Tyr Phe Glu Trp His
92   5   10   15
93 Leu Pro Asn Asp Gly Asn His Trp Asn Arg Leu Arg Asp Asp Ala Ala
94   20   25   30
95 Asn Leu Lys Ser Lys Gly Ile Thr Ala Val Trp Ile Pro Pro Ala Trp
96   35   40   45
97 Lys Gly Thr Ser Gln Asn Asp Val Gly Tyr Gly Ala Tyr Asp Leu Tyr
98   50   55   60
99 Asp Leu Gly Glu Phe Asn Gln Lys Gly Thr Val Arg Thr Lys Tyr Gly
100 65   70   75   80
101 Thr Arg Ser Gln Leu Gln Gly Ala Val Thr Ser Leu Lys Asn Asn Gly
102   85   90   95
103 Ile Gln Val Tyr Gly Asp Val Val Met Asn His Lys Gly Gly Ala Asp
104   100   105   110
105 Gly Thr Glu Met Val Asn Ala Val Glu Val Asn Arg Ser Asn Arg Asn
106   115   120   125
107 Gln Glu Ile Ser Gly Glu Tyr Thr Ile Glu Ala Trp Thr Lys Phe Asp
108   130   135   140

RAW SEQUENCE LISTING   DATE: 11/14/2001
PATENT APPLICATION: US/09/590,375   TIME: 13:38:59

Input Set : A:\2173-0120.st25.txt
Output Set: N:\CRF3\11142001\I590375.raw

```
109 Phe Pro Gly Arg Gly Asn Thr His Ser Asn Phe Lys Trp Arg Trp Tyr
110 145               150               155               160
111 His Phe Asp Gly Thr Asp Trp Asp Gln Ser Arg Gln Leu Gln Asn Lys
112               165               170               175
113 Ile Tyr Lys Phe Arg Gly Thr Gly Lys Ala Trp Asp Trp Glu Val Asp
114               180               185               190
115 Ile Glu Asn Gly Asn Tyr Asp Tyr Leu Met Tyr Ala Asp Ile Asp Met
116           195               200               205
117 Asp His Pro Glu Val Ile Asn Glu Leu Arg Asn Trp Gly Val Trp Tyr
118       210               215               220
119 Thr Asn Thr Leu Asn Leu Asp Gly Phe Arg Ile Asp Ala Val Lys His
120 225               230               235               240
121 Ile Lys Tyr Ser Tyr Thr Arg Asp Trp Leu Thr His Val Arg Asn Thr
122               245               250               255
123 Thr Gly Lys Pro Met Phe Ala Val Ala Glu Phe Trp Lys Asn Asp Leu
124               260               265               270
125 Ala Ala Ile Glu Asn Tyr Leu Asn Lys Thr Ser Trp Asn His Ser Val
126           275               280               285
127 Phe Asp Val Pro Leu His Tyr Asn Leu Tyr Asn Ala Ser Asn Ser Gly
128       290               295               300
129 Gly Tyr Phe Asp Met Arg Asn Ile Leu Asn Gly Ser Val Val Gln Lys
130 305               310               315               320
131 His Pro Ile His Ala Val Thr Phe Val Asp Asn His Asp Ser Gln Pro
132               325               330               335
133 Gly Glu Ala Leu Glu Ser Phe Val Gln Ser Trp Phe Lys Pro Leu Ala
134               340               345               350
135 Tyr Ala Leu Ile Leu Thr Arg Glu Gln Gly Tyr Pro Ser Val Phe Tyr
136           355               360               365
137 Gly Asp Tyr Tyr Gly Ile Pro Thr His Gly Val Pro Ser Met Lys Ser
138       370               375               380
139 Lys Ile Asp Pro Leu Leu Gln Ala Arg Gln Thr Tyr Ala Tyr Gly Thr
140 385               390               395               400
141 Gln His Asp Tyr Phe Asp His His Asp Ile Ile Gly Trp Thr Arg Glu
142               405               410               415
143 Gly Asp Ser Ser His Pro Asn Ser Gly Leu Ala Thr Ile Met Ser Asp
144               420               425               430
145 Gly Pro Gly Gly Asn Lys Trp Met Tyr Val Gly Lys His Lys Ala Gly
146           435               440               445
147 Gln Val Trp Arg Asp Ile Thr Gly Asn Arg Ser Gly Thr Val Thr Ile
148       450               455               460
149 Asn Ala Asp Gly Trp Gly Asn Phe Thr Val Asn Gly Gly Ala Val Ser
150 465               470               475               480
151 Val Trp Val Lys Gln
152               485
155 <210> SEQ ID NO: 3
156 <211> LENGTH: 1753
157 <212> TYPE: DNA
158 <213> ORGANISM: Bacillus sp. KSM-K38
160 <220> FEATURE:
```

RAW SEQUENCE LISTING   DATE: 11/14/2001
PATENT APPLICATION: US/09/590,375   TIME: 13:38:59

Input Set : A:\2173-0120.st25.txt
Output Set: N:\CRF3\11142001\I590375.raw

```
161 <221> NAME/KEY: sig_peptide
162 <222> LOCATION: (162)..(224)
164 <220> FEATURE:
165 <221> NAME/KEY: mat_peptide
166 <222> LOCATION: (225)..()
168 <220> FEATURE:
169 <221> NAME/KEY: CDS
170 <222> LOCATION: (162)..(1664)
173 <400> SEQUENCE: 3
174 gtatgcgaaa cgatgcgcaa aactgcgcaa ctactagcac tcttcaggga ctaaaccacc      60
176 ttttttccaa aaatgacatc atataaacaa atttgtctac caatcactat ttaaagctgt     120
178 ttatgatata tgtaagcgtt atcattaaaa ggaggtattt g atg aga aga tgg gta     176
179                                               Met Arg Arg Trp Val
180                                                       -20
182 gta gca atg ttg gca gtg tta ttt tta ttt cct tcg gta gta gtt gca     224
183 Val Ala Met Leu Ala Val Leu Phe Leu Phe Pro Ser Val Val Val Ala
184     -15                 -10                 -5                  -1
186 gat gga ttg aac ggt acg atg atg cag tat tat gag tgg cat ttg gaa     272
187 Asp Gly Leu Asn Gly Thr Met Met Gln Tyr Tyr Glu Trp His Leu Glu
188 1               5                   10                  15
190 aac gac ggg cag cat tgg aat cgg ttg cac gat gat gcc gca gct ttg     320
191 Asn Asp Gly Gln His Trp Asn Arg Leu His Asp Asp Ala Ala Ala Leu
192             20                  25                  30
194 agt gat gct ggt att aca gct att tgg att ccg cca gcc tac aaa ggt     368
195 Ser Asp Ala Gly Ile Thr Ala Ile Trp Ile Pro Pro Ala Tyr Lys Gly
196         35                  40                  45
198 aat agt cag gcg gat gtt ggg tac ggt gca tac gat ctt tat gat tta     416
199 Asn Ser Gln Ala Asp Val Gly Tyr Gly Ala Tyr Asp Leu Tyr Asp Leu
200     50                  55                  60
202 gga gag ttc aat caa aag ggt act gtt cga acg aaa tac gga act aag     464
203 Gly Glu Phe Asn Gln Lys Gly Thr Val Arg Thr Lys Tyr Gly Thr Lys
204 65                  70                  75                  80
206 gca cag ctt gaa cga gct att ggg tcc ctt aaa tct aat gat atc aat     512
207 Ala Gln Leu Glu Arg Ala Ile Gly Ser Leu Lys Ser Asn Asp Ile Asn
208             85                  90                  95
210 gta tac gga gat gtc gtg atg aat cat aaa atg gga gct gat ttt acg     560
211 Val Tyr Gly Asp Val Val Met Asn His Lys Met Gly Ala Asp Phe Thr
212             100                 105                 110
214 gag gca gtg caa gct gtt caa gta aat cca acg aat cgt tgg cag gat     608
215 Glu Ala Val Gln Ala Val Gln Val Asn Pro Thr Asn Arg Trp Gln Asp
216         115                 120                 125
218 att tca ggt gcc tac acg att gat gcg tgg acg ggt ttc gac ttt tca     656
219 Ile Ser Gly Ala Tyr Thr Ile Asp Ala Trp Thr Gly Phe Asp Phe Ser
220     130                 135                 140
222 ggg cgt aac aac gcc tat tca gat ttt aag tgg aga tgg ttc cat ttt     704
223 Gly Arg Asn Asn Ala Tyr Ser Asp Phe Lys Trp Arg Trp Phe His Phe
224 145                 150                 155                 160
226 aat ggt gtt gac tgg gat cag cgc tat caa gaa aat cat att ttc cgc     752
227 Asn Gly Val Asp Trp Asp Gln Arg Tyr Gln Glu Asn His Ile Phe Arg
```

```
228                 165                 170                   175
230 ttt gca aat acg aac tgg aac tgg cga gtg gat gaa gag aac ggt aat        800
231 Phe Ala Asn Thr Asn Trp Asn Trp Arg Val Asp Glu Glu Asn Gly Asn
232                 180                 185                 190
234 tat gat tac ctg tta gga tcg aat atc gac ttt agt cat cca gaa gta        848
235 Tyr Asp Tyr Leu Leu Gly Ser Asn Ile Asp Phe Ser His Pro Glu Val
236             195                 200                 205
238 caa gat gag ttg aag gat tgg ggt agc tgg ttt acc gat gag tta gat        896
239 Gln Asp Glu Leu Lys Asp Trp Gly Ser Trp Phe Thr Asp Glu Leu Asp
240         210                 215                 220
242 ttg gat ggt tat cgt tta gat gct att aaa cat att cca ttc tgg tat        944
243 Leu Asp Gly Tyr Arg Leu Asp Ala Ile Lys His Ile Pro Phe Trp Tyr
244 225                 230                 235                 240
246 aca tct gat tgg gtt cgg cat cag cgc aac gaa gca gat caa gat tta        992
247 Thr Ser Asp Trp Val Arg His Gln Arg Asn Glu Ala Asp Gln Asp Leu
248                 245                 250                 255
250 ttt gtc gta ggg gaa tat tgg aag gat gac gta ggt gct ctc gaa ttt       1040
251 Phe Val Val Gly Glu Tyr Trp Lys Asp Asp Val Gly Ala Leu Glu Phe
252                 260                 265                 270
254 tat tta gat gaa atg aat tgg gag atg tct cta ttc gat gtt cca ctt       1088
255 Tyr Leu Asp Glu Met Asn Trp Glu Met Ser Leu Phe Asp Val Pro Leu
256             275                 280                 285
258 aat tat aat ttt tac cgg gct tca caa caa ggt gga agc tat gat atg       1136
259 Asn Tyr Asn Phe Tyr Arg Ala Ser Gln Gln Gly Gly Ser Tyr Asp Met
260         290                 295                 300
262 cgt aat att tta cga gga tct tta gta gaa gcg cat ccg atg cat gca       1184
263 Arg Asn Ile Leu Arg Gly Ser Leu Val Glu Ala His Pro Met His Ala
264 305                 310                 315                 320
266 gtt acg ttt gtt gat aat cat gat act cag cca ggg gag tca tta gag       1232
267 Val Thr Phe Val Asp Asn His Asp Thr Gln Pro Gly Glu Ser Leu Glu
268                 325                 330                 335
270 tca tgg gtt gct gat tgg ttt aag cca ctt gct tat gcg aca att ttg       1280
271 Ser Trp Val Ala Asp Trp Phe Lys Pro Leu Ala Tyr Ala Thr Ile Leu
272             340                 345                 350
274 acg cgt gaa ggt ggt tat cca aat gta ttt tac ggt gat tac tat ggg       1328
275 Thr Arg Glu Gly Gly Tyr Pro Asn Val Phe Tyr Gly Asp Tyr Tyr Gly
276         355                 360                 365
278 att cct aac gat aac att tca gct aaa aaa gat atg att gat gag ctg       1376
279 Ile Pro Asn Asp Asn Ile Ser Ala Lys Lys Asp Met Ile Asp Glu Leu
280         370                 375                 380
282 ctt gat gca cgt caa aat tac gca tat ggc acg cag cat gac tat ttt       1424
283 Leu Asp Ala Arg Gln Asn Tyr Ala Tyr Gly Thr Gln His Asp Tyr Phe
284 385                 390                 395                 400
286 gat cat tgg gat gtt gta gga tgg act agg gaa gga tct tcc tcc aga       1472
287 Asp His Trp Asp Val Val Gly Trp Thr Arg Glu Gly Ser Ser Ser Arg
288                 405                 410                 415
290 cct aat tca ggc ctt gcg act att atg tcg aat gga cct ggt ggt tcc       1520
291 Pro Asn Ser Gly Leu Ala Thr Ile Met Ser Asn Gly Pro Gly Gly Ser
292             420                 425                 430
```

VERIFICATION SUMMARY
PATENT APPLICATION: **US/09/590,375**

DATE: 11/14/2001
TIME: 13:39:00

Input Set : **A:\2173-0120.st25.txt**
Output Set: **N:\CRF3\11142001\I590375.raw**